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Door arrangement for a motor vehicle

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The invention relates to a door arrangement for closing an entry opening of a motor vehicle with the features of the precharacterizing clause of claim 1.

10 DE 43 31 177 A1 discloses a door arrangement of this type which comprises a swing-and-slide door which can be moved between a closed state and an open state. In its closed state, the swing-and-slide door closes an opening region assigned to it and, in the process, is
15 situated in a first plane, in which a side wall of the vehicle, which side wall is adjacent to the entry opening, is also situated. In its open state, the swing-and-slide door opens up the opening region assigned to it and is arranged next to the entry
20 opening in the longitudinal direction of the vehicle and on the outside in front of the side wall. The swing-and-slide door is then situated in a second plane offset outward parallel to the first plane.

25 In the case of a door arrangement of this type, the length, as measured in the longitudinal direction of the vehicle, of the side wall, in front of which the swing-and-slide door is situated in the open state, limits the opening width of the entry opening. In the
30 case of a drivers' cab which is of relatively short construction in the longitudinal direction of the vehicle, the side wall has a correspondingly small length, as a result of which the entry opening also has a comparatively small opening width. In particular in
35 the case of a delivery vehicle, in which the vehicle driver passes the individual objects to be delivered out of the vehicle through the entry opening, this may lead to problems with larger deliveries.

DE 296 08 211 U1 discloses a two-part sliding door for a vehicle, in which a side wall of the vehicle extends in a first plane while a first sliding door part extends in a second plane which is offset outward parallel with respect to the first plane. The second sliding door part is arranged in a third plane which is offset outward parallel with respect to the second plane. The first sliding door part is mounted on the vehicle in a manner such that it can be displaced longitudinally in the second plane. In a corresponding manner, the second sliding door part is also mounted in a manner such that it can be displaced longitudinally in the third plane. Since side wall and sliding door parts are situated in three different planes spaced apart from one another, the vehicle equipped therewith has a relatively wide construction transversely with respect to its longitudinal direction, which may be disadvantageous.

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The present invention is concerned with the problem of specifying, for a door arrangement of the type mentioned at the beginning, an improved embodiment which can be used in particular in the case of a drivers' cab of a vehicle having a short construction in the longitudinal direction of the vehicle, in particular of a transporter or of any other desired commercial vehicle.

30 This problem is solved according to the invention by the subject matter of the independent claim. Advantageous embodiments are the subject matter of the dependent claims.

35 The invention is based on the general concept of providing two swing-and-slide doors which, in the closed state, are situated in the same plane as the

side wall and which, in the open state, are situated in two different planes which are offset outward parallel to the first plane. This construction makes it possible for the entry opening to be of approximately twice the dimensions in the longitudinal direction of the vehicle as the side wall. The loading and unloading of the vehicle through the entry opening can therefore be facilitated even for bulky objects. Similarly, entry into and exit from the vehicle are facilitated. Furthermore, the door arrangement according to the invention is not built up in the transverse direction of the vehicle, at least in the closed state, and so, in the closed state, the swing-and-slide doors do not protrude outward over the side wall.

According to a particularly advantageous embodiment, the first swing-and-slide door can be mounted on the vehicle in a manner such that it can be swung and displaced, for example via a corresponding first swing-and-slide device while the second swing-and-slide door is mounted on the first swing-and-slide door in a manner such that it can be swung and displaced, for example via a corresponding second swing-and-slide device. The second swing-and-slide door can therefore always be moved relative to the first swing-and-slide door while the first swing-and-slide door can be moved together with the second swing-and-slide door, which is mounted thereon, relative to the vehicle. The mounting of the second swing-and-slide door on the first swing-and-slide door enables a device for mounting the second swing-and-slide door to be structurally simplified. In particular, for the mounting of the first swing-and-slide door and for the mounting of the second swing-and-slide door, use can be made of essentially structurally identical bearing devices which merely have to be adapted slightly to the particular mounting configuration.

Further important features and advantages of the invention emerge from the subclaims, from the drawings and from the associated description of the figures with
5 reference to the drawings.

It goes without saying that the features mentioned above and those which have yet to be explained below can be used not only in the respectively stated
10 combination but also in other combinations or on their own without departing from the scope of the present invention.

Preferred exemplary embodiments of the invention are
15 illustrated in the drawings and are explained in more detail in the description below, with the same reference numbers referring to identical or functionally identical or similar components.

20 In the drawings, in each case diagrammatically:

figs 1 to 5 show highly simplified side views of a door arrangement according to the invention in various states,
25 figs 6 to 10 show side views as in figs 1 to 5, but with different kinematics.

According to figs 1 to 10, a door arrangement 1 according to the invention comprises a first swing-and-slide door 2 and a second swing-and-slide door 3. The
30 two swing-and-slide doors 2, 3 serve to close a lateral entry opening 4 of a motor vehicle 5, which is only partially illustrated. The entry opening 4 is bordered in a conventional manner by a door frame 6 and is
35 adjacent to a side wall 8 of the vehicle 5 in a longitudinal direction 7 of the vehicle, symbolized by a double arrow. The vehicle 5 is expediently a

transportation vehicle or any other desired commercial vehicle which is equipped with a driver's cab 9. The driver's cab 9 is arranged, with respect to a direction of travel 10 of the vehicle 5 that is symbolized by an arrow, in front of a superstructure 11 (only partially indicated). The particular payload or load of the vehicle 5 can then be accommodated in this superstructure 11.

10 In the case of the preferred embodiment shown, the first swing-and-slide door 2 is therefore arranged behind the second swing-and-slide door 3 with respect to the direction of travel 10, so that the first swing-and-slide door 2 may also be referred to as the rear swing-and-slide door 2 while the second swing-and-slide door 3 may also be referred to as the front swing-and-slide door 3. The first swing-and-slide door 2 is assigned to a first opening region 12 of the entry opening 4 while the second swing-and-slide door 3 is assigned to a second opening region 13. The two opening regions 12, 13 together form the entire entry opening 4.

The side wall 8 is situated in a first plane 14 which extends essentially parallel to the longitudinal direction 7 of the vehicle, and is oriented essentially vertically. In a closed state of the door arrangement 1 that is reproduced in figs 1 and 6, the two swing-and-slide doors 2 and 3 are situated essentially likewise in this first plane 14. That is to say, the two swing-and-slide doors 2 and 3 end essentially flush with the side wall 8, as a result of which a uniform side front for the vehicle 5 or for its driver's cab 9 is formed.

35 According to the open state shown in figs 5 and 10, the first swing-and-slide door 2 is situated in a second plane 15 which extends parallel to the first plane 14

and is spaced apart from the latter outward with respect to the vehicle 5. In a corresponding manner, in the open state, the second swing-and-slide door 3 is situated in a third plane 16 which likewise runs
5 parallel to the first plane 14 and is spaced apart from the latter outward with respect to the vehicle 5. In the case of the special embodiments shown here, the third plane 16 is arranged further outward with respect to the vehicle 5 than the second plane 15. Accordingly,
10 the second plane 15 is situated between the first plane 14 and the third plane 16.

In principle, different kinematics is also possible, in which, for example, the third plane 16 is arranged
15 between the first plane 14 and the second plane 15, so that in the open state, the second swing-and-slide door 3 is accordingly situated between the side wall 8 and the first swing-and-slide door 2.

20 In the open state, the first swing-and-slide door 2 is arranged next to the opening entry 4 and, in particular, next to the first opening region 12. In this case, the first swing-and-slide door 2 is offset to the rear with respect to the direction of travel 10
25 and is slid on the outside in front of the side wall 8, so that it covers the side wall 8 essentially completely or congruently on the outside. In a corresponding manner, the second swing-and-slide door 3 is also arranged, in the open state, next to the entry
30 opening 4 and next to the first opening region 12. The second swing-and-slide door 3 here is likewise displaced to the rear with respect to the direction of travel 10 in front of the side wall 8 in such a manner that the second swing-and-slide door 3 likewise covers
35 the side wall 8 and therefore also the first swing-and-slide door 2 essentially completely or congruently on the outside.

As can clearly be seen in figs 5 and 10, with the aid of the door arrangement 1 according to the invention the entry opening 4 can be approximately twice as large
5 in the longitudinal direction 7 of the vehicle as the side wall 8. The two swing-and-slide doors 2, 3 are expediently of approximately identical dimensions in the longitudinal direction 7 of the vehicle. The two
10 swing-and-slide doors 2, 3 are expediently approximately the same size in the longitudinal direction 7 of the vehicle as the side wall 8.

In addition, the kinematics of the door arrangement 1 is expediently matched to the superstructure 11 of the
15 vehicle 5 in such a manner that the swing-and-slide door situated on the outside in the open state, here the second swing-and-slide door 3, does not protrude laterally over the superstructure 11 in the transverse direction of the vehicle. This ensures, for every
20 parking situation, that the door arrangement 1 can be completely opened.

The first swing-and-slide door 2 is expediently mounted on the vehicle 5, in particular in the region of the
25 frame 6 or in the region of the side wall 8. For this purpose, a corresponding first swing-and-slide device (not shown here) can be provided. A swing-and-slide device of this type may have, for example, the construction described in DE 43 31 177 A1 mentioned at
30 the beginning, which means that a suitable swing-and-slide mounting is known per se and accordingly does not have to be explained in more detail.

In principle, it is now possible also to mount the
35 second swing-and-slide door 3 on the vehicle 5 by means of a correspondingly adapted mounting in a manner such that it can be swung and displaced. In an embodiment of

this type, the two swing-and-slide doors 2, 3 could be transferred independently of each other from their particular closed position into their particular open position, so that either the first opening region 12 or
5 the second opening region 13 or both opening regions 12, 13 can be opened up.

However, an embodiment is preferred in which the second swing-and-slide door 3 is mounted on the first swing-
10 and-slide door 2 in a manner such that it can be swung and displaced. In this case, a second swing-and-slide device (not shown) which is suitable for this can be designed to be essentially identical to the construction of the previously mentioned, first swing-
15 and-slide device, so that this variant can be realized at comparatively reasonable cost.

A first kinematics of the door arrangement 1 according to the invention is explained below with reference to
20 figures 1 to 5.

In the closed state according to fig. 1, the two swing-and-slide doors 2, 3 are situated in the first plane 14 in which the side wall 8 is also situated. In this
25 case, the swing-and-slide doors 2, 3 completely close the entry opening 4.

According to fig. 2, to open the entry opening 4 first of all the second swing-and-slide door 3 is swung
30 outward about a vertical swing axis in the region of its end which is in front with respect to the direction of travel 10, so that an edge 17, which is at the rear with respect to the direction of travel 10, of the second swing-and-slide door 3 is brought out. The
35 second swing-and-slide door 3 is therefore situated in the region of its rear edge 17 on the outside in front of the first swing-and-slide door 2.

According to fig. 3, the second swing-and-slide door 3 can then be displaced relative to the first swing-and-slide door 2 until it is arranged next to the second opening region 13. In the process, the second swing-and-slide door 3 is offset outward and is displaced rearward over the first swing-and-slide door 2. The second swing-and-slide door 3 therefore covers the first swing-and-slide door 2 essentially completely on the outside. This results in a half-open state in which the first swing-and-slide door 2 still closes the first opening region 12 assigned to it while the second swing-and-slide door 3 opens up the second opening region 13. The first swing-and-slide door 2 is still situated in the first plane 14 while the second swing-and-slide door 3 is already offset to the outside, to be precise, expediently in such a way that it is situated essentially in the second plane 15.

In the half-open state, the door arrangement 1 provides a functional access for the vehicle driver without baggage or with smaller baggage.

According to fig. 4, the first swing-and-slide door 2 can now be pivoted at its end which is in front with respect to the direction of travel 10 about a vertical axis in such a manner that an edge 18 which is at the rear with respect to the direction of travel 10 is brought outward with respect to the side wall 8. The rear edge 18 of the first swing-and-slide door 2 is therefore situated on the outside in front of the side wall 8. Since the second swing-and-slide door 3 is expediently mounted on the first swing-and-slide door 2, the second swing-and-slide door 3 follows the movement of the first swing-and-slide door 2.

According to fig. 5, the first swing-and-slide door 2

can now be transferred together with the first swing-and-slide door 3 mounted on it into the open state. In this case, the first swing-and-slide door 2 is slid in front of the side wall 8, since the first swing-and-slide door 2 is now offset outward into the second plane 15 and, as a result, the second swing-and-slide door 3 is automatically offset outward into the third plane 16.

10 The closing of the entry opening 4 then takes place in a corresponding reverse sequence.

A different kinematics for the door arrangement 1 according to the invention is explained in more detail below with reference to figs 6 to 10.

Starting from the closed state according to fig. 6, to open the entry opening 4 according to fig. 7 the first swing-and-slide door 2 is swung together with the second swing-and-slide door 3 attached to it about a vertical axis which runs through that end of the second swing-and-slide door 3 which is in front with respect to the direction of travel 10. In this way, the rear edge 18 of the first swing-and-slide door 2 is brought outward with respect to the side wall 8. This rear edge 18 of the first swing-and-slide door 2 is then situated on the outside in front of the side wall 8.

According to fig. 8, the first swing-and-slide door 2 can now be displaced to the rear together with the second swing-and-slide door 3 attached to it and at the same time can be swung outward until the first swing-and-slide door 2 essentially completely covers the side wall 8. By this means, a half-open state is also achieved in fig. 8, in which the second opening region 13 is essentially completely opened up. In this half-open state, both the first swing-and-slide door 2 and

the second swing-and-slide door 3 are situated in the second plane 15. The second swing-and-slide door 3 is then arranged next to the second opening region 13 and on the outside in front of the first opening region 12.

5 In this half-open state, a comparatively narrow passage is again provided for the vehicle driver who can use it without baggage or with small baggage.

To further open the entry opening 4, according to

10 fig. 9 the second swing-and-slide door 3 can now be swung further about a vertical axis running through its front end in such a manner that its rear edge 17 is brought outward with respect to the first swing-and-

15 slide door 2. The rear edge 17 of the second swing-and-slide door is therefore situated on the outside in front of the first swing-and-slide door 2.

According to fig. 10, the second swing-and-slide door 3 can subsequently be slid to the rear over the first

20 swing-and-slide door 2 until it essentially completely covers the latter. The open state according to fig. 10 is subsequently present again, in which the second swing-and-slide door 3 is situated in the third plane 16 and is arranged essentially congruently to the first

25 swing-and-slide door 2 and essentially congruently to the side wall 8. The entry opening 4 is then essentially completely opened up.